Transcriptome-wide Analysis Reveals Hallmarks of Human Intestine Development and Maturation In Vitro and In Vivo.

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Public Summary:
Human intestinal organoids (HIOs) are a tissue culture model in which small intestine-like tissue is generated from pluripotent stem cells. By carrying out unsupervised hierarchical clustering of RNA-sequencing data, we demonstrate that HIOs most closely resemble human fetal intestine. We observed that genes involved in digestive tract development are enriched in both fetal intestine and HIOs compared to adult tissue, whereas genes related to digestive function and Paneth cell host defense are expressed at higher levels in adult intestine. Our study also revealed that the intestinal stem cell marker OLFM4 is expressed at very low levels in fetal intestine and in HIOs, but is robust in adult crypts. We validated our findings using in vivo transplantation to show that HIOs become more adult-like after transplantation. Our study emphasizes important maturation events that occur in the intestine during human development and demonstrates that HIOs can be used to model fetal-to-adult maturation.

Scientific Abstract:
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